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ISSUES OF AGRICULTURAL JOURNAL.

NOTES FOR LIBRARIES AND RESEARCH INSTITUTES.

So many requests are received from abroad for parts of the *Agricultural Journal* which were never published that the following list of all issues is given for reference. Attention is directed especially to Volume VII which had only one part:—

Vol.		Vol.	
I	3 parts, 1928	VI	2 parts, 1933
II	4 „ 1929	VII	1 part, 1934
III	3 „ 1930	VIII	4 parts, 1935-7
IV	4 „ 1931	IX	4 „ 1938
V	2 „ 1932		

Quarterly publication will be continued in future.

ISSUES OF THE AGRICULTURAL CIRCULAR.

THE following were the numbers and year of issue of the *Circular*:—

Vol. 1, 1920, 12 parts	Vol. 4, 1923, 1 part
„ 2, 1921, 5 parts	„ 5, 1924-5, 2 parts
„ 3, 1922, 4 parts	

As Number 4 of Vol. 3 was printed as "Volume 4" and Number 1 of Vol. 4 as "Volume 5" it would appear from an inspection of a complete set that Volume 4 had only a Part 4 and that there were two issues of Volume 5, Part 1.

—EDITOR.

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AGRICULTURAL JOURNAL

ISSUED BY THE

DEPARTMENT OF AGRICULTURE, FIJI.

VOL. 10.]

JUNE, 1939.

[No. 2.

EDITORIAL.

THE Department of Agriculture is endeavouring, at the present time, to demonstrate the use of compost in the maintenance of fertility of soils and in the production of food and other crops amongst Fijians and in this connexion simple methods of making composts are outlined in this issue of the *Journal*. It is intended that this article will also be published in Fijian and Hindi for its better application and wider distribution amongst small-holders. The value of farm and garden waste in the preparation of valuable plant-food is not adequately realised in Fiji and application of the simple methods of utilisation of such matter, as are described, will well repay any outlay of effort in this direction.

The recent general shortage of fresh vegetables should invite interest in a brief article on the Jerusalem artichoke which the writer indicates can readily be grown, provided that good garden soil, which has been well prepared, is used in cultivation. As locally grown, and if harvested at the right stage, the artichoke is tender, well-flavoured and palatable and forms a pleasant variation in the list of vegetables which can be grown in the course of four to five months, the roots being lifted from the beds as they are required for consumption. A list of other vegetables which have been grown successfully is also included in this issue.

Recently reports from various planters indicated that a leaf rolling-caterpillar was attacking the guava which is one of the worst of our agricultural weeds and these reports stimulated the hope that biological control would once again prove phenomenally successful in the Colony. Such hopes however, are rudely shattered by the information contained in this issue, that at least four different Hymenopterous parasites control the spread of the caterpillar concerned so that it cannot be regarded as efficient and capable in the destruction of guava leaves. Hence the old time-established methods of dealing with guava in estates and pastures, which are indicated in the text, must still be practised.

The first appearance of the Central American white ant, *Cryptotermes brevis* Walk., in Fiji is recorded in this number of the *Journal* by the Entomologist. This serious pest has been found twice in the last few years. It is a dry wood termite and liable to cause damage to wooden furniture, buildings, &c., and since it does not build an external nest but tunnels entirely within woodwork, its presence is easily overlooked. Remedies for the pest are indicated and a request for specimens is made, should its presence be further discovered. This applies to all species of these insects. Two other species of white ant are also recorded as having been found in imported wharf and in bridge timbers, indicating a need for more careful examination of imported timbers than is usually accorded on arrival in Fiji.

A simple remedy for the reduction of damage to books and papers of all kinds caused by "silverfish" is given and it is hoped the formula may be widely utilised.

In justification of the complaint, frequently expressed, that more fresh vegetables should be imported, a note is given indicating the importance of vigilance where the import of cabbage and cauliflower is concerned if the ravages of a serious pest is to be avoided.

It is pleasing to note that the introduction of compulsory grading of copra, which is referred to in this issue, has been appreciated by merchants and others as indicated by speeches on the 'wireless' and by letters published in the local press, and that the trade generally supports His Excellency's decision in the belief that the Colony will ultimately benefit by its operation. The article published in this issue compares Fiji copra with that in Rabaul but a similar comparison might be made with the product of Samoa, so that it is high time Fiji producers and merchants co-operated to the general advancement of the Colony's reputation in the world's market for this commodity.

Not only is a better quality of copra desirable but more care needs to be taken in the avoidance of adulteration of copra. For instance, in a recent shipment of 300 tons of Fiji copra, the buyers in Europe found over 750 lbs of stones, coral, iron nuts, etc., which is certainly derogatory to the reputation of the Colony's product.

In a review, the world's copra production is stated to be 1,317,000 tons but the total production of vegetable oil seeds and oils exceeds 11,000,000 tons which gives some indication of the competition which copra has to face in these days.

Furthermore, although 1,317,000 tons of copra was produced in 1937, the consumption of this commodity in the British Empire was only 157,000 tons. This is indicative of the marketing difficulties which confront copra in these days of tariff walls and self sufficiency programmes which are common to all nations in varying degrees.

The recent storms experienced in Fiji will give added interest to perusal of meteorological notes by the Harbour Master, Captain Nasmyth.

A somewhat belated extract portrays tersely the salient deliberations of the Conference of Colonial Directors of Agriculture held in London in 1938 and well repays perusal and consideration as indicating the trends of agricultural policy in the Colonies.

Special reference was made to the crucial subjects of soil erosion and the maintenance of soil fertility; the advantages of mixed farming in counteracting the results of shifting systems of agriculture; the need for harmonising an improved dietary with the limitations of agricultural conditions and the effects of defective nutrition on the physique of native peoples.

Regarding land settlement, particular emphasis was laid on the need of assistance to settlers in the purchase of essential requirements such as housing, farm buildings, stock, implements, fencing materials and other requisites and mention was made of the substantial aid, (often exceeding £1,200 per settler) which was tendered by the Land Settlement Association in Great Britain.

With reference to produce inspection, the need for obtaining the support of the mercantile community was stressed as well as the need for improvement in the quality of produce.

On the subject of the education and training of natives for settlement, emphasis was laid on the practical relationship to the conditions under which settlers had to live so that their training should not give them a distaste for their original conditions but should enable them to take a leading part in general rural improvement.

Other interesting reviews touch on varying subjects including cocoa research, copra, the preparation of turmeric, green manuring of citrus, agriculture in England, land settlement in Jamaica and forestry while the great importance of essential oils to the Netherlands East Indies is indicated in a summary of Dr. Rowan's recent bulletin on the subject which proves interesting reading.

Attention is directed to Messrs. Cooper Pegler's advertisement in this issue. We are asked to state that full details of all their spraying and dusting apparatus will be sent free to any reader mentioning this *Journal*.

SOME METHODS OF COMPOSTING SUITABLE FOR SMALL-HOLDINGS.

By

C. HARVEY,

Senior Agricultural Officer.

SMALL-HOLDERS often crop their holdings, season after season, without the incorporation of any kind of manure, until decreasing yields compel the opening of fresh land. Annual crops like cotton, maize, dryland rice, tobacco, and vegetables, require the replenishment of the soil every year or two with some kind of organic manure or compost. Artificial fertilizers are usually beyond the reach of the average small-holder, but he can easily provide himself with a supply of organic manure which will assist him to cultivate crops successfully and secure good yields. Most cultivators have not as yet fully realized the benefits of organic manure. It is a common sight to see animal manure and farm wastes scattered about on waste land, or burned, while crops nearby are in need of such additions to the soil.

Cultivators who possess cattle should never let them roam about. Cattle should always be housed in a stall at night and given a feed of Guinea or other fodder grass, sweet potato tops, bean haulms, &c. If housing is not possible, they should at least be kept in a night paddock. If the practice of housing and stall feeding is generally adopted on small-holdings, not only will crops be safeguarded from destruction by stray cattle, but there will also always be a plentiful supply of farmyard manure, which with other farm waste could be converted into a valuable compost.

Farm waste should be collected as a regular routine operation. Material such as maize stems, maize cobs, cotton stems, reeds, thatch from old houses, cut grass, weeds, household refuse and food peelings, are all suitable for compost, but hard material such as maize cobs, maize and cotton stems should be broken up or trampled before using them in the compost heap.

Cattle dung should never be allowed to lie about on the land, where its goodness will be lost by the action of rain and sun, but should be stored under covers until required. Wood-ashes from the kitchen should be collected in receptacles. Where cattle are housed in stalls the urine earth (finer scrapings from the earth floor of the cattle stall) should be gathered up and utilised with the farm waste for compost.

The preparation of compost by the rainfed process may be briefly described as follows: Collect all farm waste such as weeds, loppings, sweepings and straw and spread it in the cattle stall once a week to serve as bedding for the

cattle. Once a week take out this material, which has absorbed the liquid excreta, together with the dung, heap it on a level drained site, and mix with wood-ashes, urine earth, and household sweepings. A pit is not required, except possibly in the dry season in the dry zone, nor is a roof necessary. The size of the heap depends on the amount of material, but it may be 2 feet high, 14 feet broad and any convenient length. After the heap has been well wetted with rain the material should be raked up from a 4 feet wide strip on either side and this is piled in the middle. The heap is then 6 feet wide and about 4 feet high. Three weeks later the heap will have sunk in height and it should then be entirely turned over to one side and heaped again to the original height. One month later the heap is again turned in similar fashion. It is always advisable to turn the heap on a rainy day. An extra turning may be necessary if the material has not rotted sufficiently, but the compost should be ready for use about four months after the commencement of the operation.

One load of rotted compost can be made from three loads of material. In the wet zone of Fiji, particularly in the wet season, the heaps should, from the start, be covered with reeds or grass in the form of a rough thatch, as if the material is too wet it will not decompose in the way right.

If the cultivator has no cattle, compost can be made by using any soft material such as weeds, grass or straw, and loppings, mixed with wood ash and ordinary earth.

Compost made from a mixture of materials breaks down more satisfactorily than if made from only one kind of material.

To hasten decomposition a heap may, at the time of turning, be inoculated with a small quantity of compost from an older heap, or by watering with water in which cattle dung has been soaked for some hours.

It is necessary that the heap should be at no time too dry, nor too wet; nor should it be packed too lightly nor too closely. This is largely a matter of practice, but if the cultivator uses a mixture of materials, makes the heaps of the right size, and turns them at the correct intervals, he should not fail to make good compost.

When quite broken down the compost may be applied to the ground and forked or ploughed in but not left on the surface to dry. It should also be used mixed with top soil in holes dug for the planting of fruit and other trees.

The above note has been adapted from Leaflet No. 137 of the Department of Agriculture, Ceylon.

JERUSALEM ARTICHOKE (*Helianthus tuberosus*).

By

W. L. PARHAM,

Agricultural Assistant.

In temperate climates the Jerusalem artichoke is valued as a palatable vegetable which becomes readily established and almost becomes a weed even in poor soils.

In Fiji during the past eighteen years the writer attempted with only slight success to grow this vegetable under conditions favourable to the growth of other temperate zone vegetables.

Late in September, 1938, a small batch of tubers was brought from Canada by the Director of Agriculture. Though it was late in the year for planting European vegetables a trial was made at Korovou, Tailevu. It was judged that previous want of success was due to the hard lumpy nature of the

soils on which the trials were made, so at Korovou the planting was done on the most finely-divided, friable soil available. This was on an old dump of wood-ash which had been well cultivated for some months before.

At Korovou the plants confirmed Macmillan's experience in Ceylon* and reached the height of 3 feet only and not 6 feet as in cooler climates. Otherwise the artichokes made normal growth and matured in 4—5 months after planting. Sample tubers dug have been of good flavour.

This trial indicates that in good garden soil, as the term is understood in temperate countries, the Jerusalem artichoke can be grown with success in Fiji.

* H. F. Macmillan. "Tropical Gardening and Planting." 1935. Third Edition.

ENTOMOLOGICAL NOTES.

By

R. J. A. W. LEVER, B.Sc. (Hons.), D.I.C., A.I.C.T.A., F.L.S.

1. GUAVA LEAF-ROLLING CATERPILLARS.

IN 1938 some attention was given to attacks on the introduced South American guava by caterpillars which spin together the terminal leaves, causing a die-back which, though never observed to be fatal, checked the growth of this noxious plant.

The insect was first reported on south Taveuni but was found by the writer on Viti Levu and, in 1939, on Vanua Levu. The caterpillar concerned is olive-green in colour with an orange-brown head, measures 20 mm., (or four-fifths of an inch) when mature and spends seven days as a pupa. The moth is dingy, dark grey in colour and measures 15 mm. across the wings. The eggs are laid in a compact mass about one-third of an inch across, covered with the downy scales of the female's body and appear at first sight as a patch of buff-coloured felt. Stroking with a camel hair brush reveals two layers of minute globular pearl-like eggs with a strongly marked network. Specimens were identified at the Imperial Institute of Entomology, London, as *Spilonota holotephra* Meyr., thus enabling one to find that close relatives are pests of apple, pear, coffee and rose in other parts of the world. In Fiji, owing to guava being regarded not as a useful fruit-tree but as a real pest in plantations and grazing land, these caterpillars are considered to be beneficial. However, they are controlled by at least four different kinds of Hymenopterous (small wasp) parasites, which offset the efficiency of the caterpillars as pruners of the guava leaves. These parasites are: (1) a black-bodied *Apanteles* some 3 mm. long; (2) a brown-bodied *Cremastus* measuring 7 mm. in length; (3) (so far only from Vanua Levu) a black-bodied Elasmid parasite which has not yet been sent to London for identification; (4) another black-bodied wasp—a species of *Tetrastichus*. In addition there is a brown Ichneumon *Mesochorus* assumed to be a parasite of one of the first three and so a hyperparasite of *Spilonota*.

Two scarcer guava moths which do only a little of the damage achieved by *Spilonota* are *Setomorpha rutella* Zell., a paler grey moth with pointed forewings and ciliated hind ones and *Adoxophyes fusciana* Wlk. a tawny Tortricid moth with darker brown markings on the forewings and a span of 15 mm.

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Although guava (*Psidium guayava* L.) has been in Fiji for many years, it was not, apparently, till 1930* that it really received full recognition as a pest and the control measures adopted were: uprooting prior to ploughing; smothering cut stumps with *Micania scandens* Willd. ("mile-a-minute"); regular weeding; cutting, stacking and burning followed by slashing and smothering with *Cassia* spp. ("kau moce"), said to cost 2s. 6d. per acre, and grubbing or digging out costing £3 per acre.

* *Agricultural Journal*, Fiji, Vol. 3, No. 3, 1930.

2. CONTROL OF THE SILVERFISH.

THAT well-known pest the silverfish (*Lepisma saccharina* L.) is, like the poor, always with us and it is hoped that the following notes will be of assistance to readers.

Besides books, journals and loose records, this assertive insect attacks wall-paper, photographs, starched cotton and linen, curtains, cellophane and so-called "silk" stockings, so that it is liable to damage property of all householders of either sex.

The December issue of the *Journal* (1) recommended sodium fluoride—which is procurable locally—as an insecticide and this somewhat expensive substance is quite satisfactory.

More recently the writer has made up and tested a solution devised by the Division of Economic Entomology, Canberra, and described in their publication (2). This is prepared by mixing an ounce of flour and $1\frac{1}{2}$ oz. of sugar in 10 fluid ounces ($\frac{1}{2}$ pint) of warm water and stirring in $1\frac{1}{4}$ oz. of barium fluosilicate. The resulting paste is spread on both sides of white cardboard, which when dry, is cut up into pieces about 2 or 3 inches square. These sections are then placed in cupboards, shelves, drawers and behind pictures and furniture, 10 to 20 such baits being adequate for an average room. A diminution in silverfish abundance has since been noted where this was used in the Department Library, Suva.

In addition, pyrethrum or other spraying should be carried out for cupboards and wardrobes while stored articles can be protected by wrapping them up in newspaper whose folds should be glued together. As newspaper is made from wood which has been little treated with chemicals, it is usually unattacked by silverfish which relish those chemicals used for good stationery and glazed art paper (3). The paradichlorobenzene mentioned in (1) should be used at the rate of two tablespoonfuls per unit of area equal to a four-gallon kerosene tin. Naphthalene is cheaper and less volatile but almost as effective.

(1) *Agric. Journal*, Fiji, Vol. 9, No. 4, December, 1938.

(2) *Journal of Council of Scien. & Industr. Research.* Vol. 12, No. 1, February, 1939.

(3) *Journal*, Dept. of Agric., S. Australia, Vol XLII, No. 9, 1939. (University of Melbourne leaflet).

3. A CENTRAL AMERICAN WHITE ANT IN FIJI.

To the six species of termites or "white ants" found in Fiji, given in the last issue (Vol. 10, No. 1, p. 18) must now be added a seventh whose identification has been recently received from the Imperial Institute of Entomology, London.

This insect is *Kalotermes* (*Cryptoterme*) *brevis* Walk. and specimens were obtained from two buildings in Suva, one in a bedstead (1937) and the other from sapwood in a boarding-house (1932). The chief interest of this record

lies in the distribution of the insect which is tropical America the natural range being from Mexico to British Guiana and the West Indies (1). Its popular American name is the powder-post termite and its usual damage is to books and dry goods on shelves in stores but it also attacks furniture and woodwork of houses and is a pest of some consequence.

Except for a record in Durban, Natal, and its carriage from central America to Florida and Louisiana, this appears to be the first notification of the occurrence of this termite outside of the American region and certainly in the Pacific.

In Puerto Rico, West Indies, *Cryptotermes brevis* is a serious pest as it builds no external nest (2) but tunnels completely inside woodwork which need have no connexion with the ground as it is a dry-wood termite.

The injection of carbon bisulphide into these galleries is urged as soon as its attacks are noted: paradichlorobenzine may also be used if available. Cypress and mahogany are said to be the most resistant woods and red gum and hard maple the most susceptible (2). Of trees unlikely to be used in buildings, both breadfruit and flamboyante are even more prone to its attacks. It is so general in Trinidad that few buildings, unless recently built, are free from it (3) and its wide distribution is probably to be attributed to the ease by which entire colonies may be transported in relatively small objects such as articles of furniture.

Enough has been said to show the possible danger of this introduced termite and it is hoped that some specimens of any white ant will be forwarded in a tin or well-stoppered bottle to the Entomologist before the community is completely destroyed.

(1) "Termites and Termite Control." 1934. University of California Press.

(2) Wolcott, G. N., 1924. Puerto Rico Bull., No. 37, Dept. of Agriculture.

(3) Adamson, A. M., 1938. Tropical Agriculture, Vol. XV, No. 10, October.

4. ADDITIONAL NOTES ON TWO LOCAL WHITE ANTS.

THE introduced Australian *Coptotermes acinaciformis* was mentioned in the last issue of the *Journal* as being a serious pest in *Eucalyptus* staging in Suva and attention is therefore directed to the following statement on its present status in Australia:—

"Largely by virtue of its almost Australia-wide distribution, *Coptotermes acinaciformis* is undoubtedly the most important economic termite in this country. In addition to being responsible for the greater part (probably far the greater part) of the sum of the damage done by termites to buildings, poles, construction timber, &c., it sometimes attacks fruit trees and crop and garden plants, and it is the most important pest of commercial hardwood forests in northern New South Wales."*

The small *Eutermes olidus* Hill was mentioned as being essentially a jungle species but in March, 1939, the writer found it established in the supporting posts of a suspension bridge near Dreketi, Vanua Levu, which appears to be the first record of this white ant as a potential harmful insect.

* Council for Scientific and Industrial Research. Twelfth Annual Report for the year 1937-8. No. 99. Canberra, F.C.T.—4s.

5. THE CABBAGE BUTTERFLY IN NEW ZEALAND.

As showing the importance of the local embargo enforced on crucifers (cabbage, cauliflowers and lettuce) from New Zealand, the following extract from a recent official publication (1) in that country is of interest:—

"There is no doubt that parasitic control of the white butterfly has proved outstandingly successful, even though we are faced with occasional outbreaks of the pest, such as occurred during last season (1937-38). It is not too much to say that were it not for the presence of the parasite the growing of farm crops, such as rape, turnips, chou mœllier, swedes, &c., would be rendered so uncertain as to be economically impracticable.

"Control of an insect pest through the use of parasites can seldom, if ever, reach 100 per cent., although there are times when the butterfly parasite so far reduces the numbers of its host that even the dusting or spraying of cabbages or cauliflowers by the 'home gardener' or 'market grower,' where a high degree of control is required, becomes unnecessary."

That very strict local examination of such vegetables is necessary is proved by the fact that in July, 1934, the then Government Entomologist saw a female cabbage butterfly in Suva at the wharf reclamation area. Fortunately nothing came of this accidental importation but had it been a fertilised female which reached cabbages, radish or nasturtiums, there would have been a great danger of its becoming established.

The small diamond back moth *Plutella maculipennis* (Curt.), which has been a member of the Fiji fauna for years and probably reached the Colony from Australia, was intercepted in the caterpillar stage in April, 1939, by the Produce Inspector in cabbages imported from that country. It was accidentally introduced into New Zealand about sixty years ago (2).

(1) *New Zealand Journal of Agriculture*, Vol. 58, No. 4, April, 1939.

(2) *Proceed. Roy. Entom. Soc. Lond.*, Vol 4, No. 5, 1939.

6. IDENTIFICATION OF LOCAL PARASITES.

CERTAIN Hymenopterous or small wasp-like parasites of different pests have recently been identified by the Imperial Institute of Entomology, to whose Director the writer is much indebted.

In 1938, Mr. Simmonds, in dealing (1) with the small coconut leaf-moth *Agonoxena argaula* Meyr., mentioned two of its parasites which he first bred out in 1922 (2). These are now known to be *Brachymeria fijiensis* Ferr., which is a robust little Chalcid with reddish legs, while the Braconid *Apanteles* is still specifically undetermined.

Since then the present writer has bred two more parasites from the larva of this moth, viz., an orange-brown *Bracon* somewhat like the *B. hebetor* Say. from the copra moth *Ephestia* (3), and lastly a black *Eupelmus* comparable with the species bred from the leaf-mining beetle *Promecotheca reichei*. The caterpillar did some damage to palms on the Natewa Peninsula, Vanua Levu, in October, 1938, but the parasites appeared to check it later. It was reported also on Makuluva Island in June, 1939.

The larger Braconid from the ivi-nut moth *Cryptophlebia*, given in (3) as *Macrocentrus*, was found to be a new species, viz., *M. calacte* Nixon, and the same holds good for the smaller Braconid parasite of *Chaetodacus passifloræ* which is *Phænocarpa leveri* Nixon.

(1) Simmonds, H. W., 1938. Bull. No. 20, Dept. of Agriculture, Fiji.

(2) Simmonds, H. W., 1922. *Agric. Circular*, Fiji, Vol. 3, No. 1.

(3) Lever, R. J. A. W., 1938. *Agric. Journal*, Fiji, Vol. 9, No. 3, Sept.

7. THE GIANT TOAD.

THE article on page 700 of the February number of "United Empire" dealing with the giant toad states that it has for defensive purposes a gland situated in the middle of its back. If this were true it would indeed be a "unique weapon" as no amphibian in the world has a median weapon in such a place. The protection offered actually comes from a paired gland situated on each side of the neck and the contents are scarcely "liquid" but like a fairly sticky, milky gum. It is also not accurate to say the toad was introduced twenty-five years ago from Mexico to Barbados as it was sent from Cayenne (French Guiana) to Martinique and Barbados prior to 1844 when it was sent to Jamaica.

Further, it was introduced into Hawaii in 1932, which is seven years ago, not "about three," and it was imported specifically, not "somewhat half-heartedly."

The unsigned article in question is of a popular nature but this does not excuse a toothless, dry-skinned warty toad being called "a member of the Frog family," which latter are wet and smooth-skinned and usually have teeth.

The following extract from a West Indian official publication* shows that the giant toad—introduced to Puerto Rico in 1920 from Barbados and again in 1924 from Jamaica—is highly regarded as a control for the local white grubs, comparable with our *Rhoepa* on sugar cane:—

"The white grubs, *Phyllophaga* spp., have practically disappeared from the low lands of Puerto Rico as a result of the introduction and colonization by the station some years ago of the giant toad, *Bufo marinus* L. As the toad is not readily adapted to the mountainous regions of the island, the white grubs and their predators are now found in abundance only in these mountainous sections."

* Report of the Puerto Rico Experiment Station for 1937.

COPRA GRADING.

"THE present position of the local copra industry was briefly described in the last issue of the *Agricultural Journal* (Vol. 10, No. 1, 1939) in which reference was made to the depression resulting from the continued low prices for this commodity.

In the past decade the industry has suffered increasingly from competing substitutes for coconut oil and many of these substitutes are standardized products such as butter, palm oil, soya bean oil, cotton seed oil, groundnut oil, whale oil, lard, tallow, &c.

On the other hand, copra as exported from Fiji is not standardized and is by repute poor and variable in quality and suffers in consequence in value as compared with the product from some other producing territories.

Thus, New Guinea copra, which some years ago was valued similarly to the product of Fiji, has during the past four years, as a direct result of compulsory grading, gained average values of approximately 15s. per ton in excess of the average prices ruling for Fiji copra on the London market, while Straits copra has averaged approximately £1 per ton better than local copra on the same market.

Hence, one of the ways in which local copra can the better withstand existing competition is by exporting it in standardized grades so that the buyers can be assured of a product of consistently good quality.

Some efforts have been made by the local merchants to effect a measure of standardization by grading in the past few years, but the grades in use have not been defined and have not been strictly maintained.

Instructive methods of improving copra have been demonstrated by the Department of Agriculture during the last three years and a grading table, applicable to the needs of the local industry, has been devised and tried out in practice with satisfactory results.

This grading table is based on the salient characteristics associated with good and bad quality copra, namely, colour, cleanliness, condition, smell, (free fatty acid) and dryness, and points, awarded according to a descending scale of excellency for each character, when summed up, indicate the quality of the sample.

On the average, the copra exported from Fiji is of poor quality and it is contended that a system of grading would help very materially in gaining a better reputation (and an improved price) for the product on the world's markets.

Moreover, though poor copra is still marketable, as competition increases it is readily conceivable that a time may come when sales of such a product may not be possible. Hence it is imperative that steps should early be taken to improve the grade of copra exported so that the coconut industry, which is of great importance to the Colony, may be maintained.

Furthermore, consistent improvement in the quality of the copra is associated with better prices, as already shown above, and in addition, losses in manufacture, in storage and in transit are materially reduced while arbitrations (generally affecting prices to the extent of two per cent. or more) can largely be eliminated.

With a little additional care in manufacture and more attention paid to copra kilns in the wet zones it is considered that local estates should be able to produce copra consistently as good as Rabaul copra, while an increasing percentage of native copra should also be of similar quality. It may be mentioned that if half the local production was up to Rabaul standard (and prices, say, 15s. per ton in advance of Fiji prices) some £12,000 additional would accrue annually to the producers in the Colony. Actually during the last six months the average price of Rabaul copra has exceeded that of Fiji by over 17s. per ton (sterling).

Closely associated with the quality of copra in Fiji is the unique practice which has developed of selling "green copra" to local storekeepers and estate managers who dry the copra themselves for sale.

This practice has been abused in numerous ways in the past, and it is the Government's intention that more frequent inspection of licensed buyers should be made so that improvements may gradually be effected in copra derived from this source.

The need for some system of grading aiming at the general improvement in the standard of copra exported from the Colony, and the advantages likely to accrue therefrom, are obvious and hence it has now been ruled by the Government that compulsory grading shall be brought into force in Fiji for the general welfare of the Colony as soon as the necessary arrangements can be completed.

It is hoped therefore that the merchants and producers of all classes will co-operate with the Government in its efforts to build up a better reputation for Fiji copra than it at present holds in the world's markets for the ultimate benefit of the Colony."

The above article was recently published (22/5/39) in the local press by command of His Excellency the Governor and as it is of vital importance to copra producers, it was considered that wider publicity would be of general benefit, hence its inclusion in this issue of the *Journal*.

NON-FRUITING OF APPARENTLY HEALTHY TREES.

By

H. W. JACK, M.B.E., D.Sc., B.A.,

Director of Agriculture.

DURING a recent tour of Vanua Levu and Taveuni the writer noticed on a few occasions healthy well-grown trees and palms that bore no fruit, and advice was sought as to possible remedies to induce fruiting.

Some times such non-fruiting of healthy trees is said to be due to excess of nitrogen in the soil or to an unbalanced condition of plant nutrients in it; trees in this category are usually found growing in soil which is naturally very rich in nitrogen. For such trees it is necessary to interfere with the supply of nitrogen and towards this end three well-known remedies are sometimes applied, either separately or in combination.

First, the supply of nitrogen is curtailed; secondly, additional superphosphate and potash are added to the soil, or thirdly, bark-ringing or, alternatively, root-pruning is applied. The reasons for the application of the first two remedies indicated are obvious as a counterbalance in the nutritive environment of the plants concerned and so need no comment.

Bark-ringing effects a conservation of the carbohydrates in the upper parts of the tree and thus tends to inhibit further vegetative growth but encourages the growth of fruit-buds.

The process of ringing the bark simply involves the removal of a ring of bark or a partial ring of bark from the stem of the tree below the point of formation of branching. The best time to ring-bark a tree is shortly before or during the time the tree is in flower.

In ringing, the bark may be removed down to the cambium from a complete circle of the stem. In this case about a quarter of an inch of bark should be removed, the bared part of the stem being preferably treated with a disinfectant. Alternatively, ringing may be done in two half rings, each half ring being about 0.75 of an inch in width and cut so that each half ring is quite separate and spaced some 4 inches apart and in such a way that the ends of one half ring are vertically above those of the other and so that the two half rings together embrace the entire circumference of the stem, at different levels. In this instance, the wound must be reopened annually, whereas with a single complete ring it is usual to allow the wound to heal over naturally.

Ring-barking is reputed also to be useful in improving defects in flavour of fruit, in preventing trees from becoming too large and in reducing the dropping of immature fruit.

In root pruning, the method may be varied according to the type of tree concerned. Thus, in the Far East, where root pruning of coconuts is a common and remunerative practice applied to unproductive palms, the usual method adopted is to slash a number of surface roots which are apparent close to the base of the bole, either on two opposite sides only or completely encircling the stem. Alternatively, small fires are applied to half the base of the palm until it is well charred.

With trees whose roots are not apparent on the surface, the practice consists of digging a trench about one foot deep and one foot wide in a circle all round the stem of the tree. The trench should be dug at a distance from the tree equal to the horizontal length of the branches or leaves. Thus, for an ordinary tall coconut the radius of the circle would be about 8 to 10 feet while for a grapefruit it would be about 6 to 7 feet depending on the spread of the tree.

In cutting the roots the operation should be done from within the circle so that the cuts slant away from the tree.

As regards coconuts, where they are planted too densely, root-pruning will not achieve any material improvement in fruiting, the cause of failure to produce fruit in this case being due to starvation resulting from excessive root-competition in the soil. In such circumstances the only hope of improvement lies in the selective thinning out of the poorer palms so as reasonably to reduce root-competition so that each palm (talls) should be provided with a superficial area of soil of not less than 576 square feet under average local conditions—say square planting at 24 feet spacing. Cultivation and mulching should be the first remedy applied to palms growing in poor soil conditions.

It is hoped that this brief note may be helpful to the few planters who made verbal inquiries as to treatment of unproductive trees growing in good soil, during my recent tour.

THE CULTIVATION AND HAND-POLLINATION OF VANILLA.

By

J. J. C. SUCKLING,

Agricultural Assistant.

VANILLA (*Vanilla planifolia* Andr.) grows as a vine, deriving part of its nourishment from the soil and part from the détritius of its support.

Although to-day the artificial substitute "vanillin" is being extensively used in commerce, a demand for the genuine product does exist and its possibilities as a subsidiary crop are good.

In choosing a site for the establishment of vanilla, advantage should be taken of available supporting material, in the form of trees, posts or fences. For more extensive propagation, posts or cuttings of quick growing trees such as *Gliricidia* or "Vau" can be erected. Tree-supports are best as they afford beneficial partial shade. Planting 8 feet by 8 feet will give 680 vines to the acre. The aspect should be warm, humid, sheltered from wind and preferably on sloping land which will thus be well drained.

Propagation is by cuttings, each about four feet long, and they are planted two to each support with the base just covered by organic matter and the tops attached to the support.

After about six months the vines will have established themselves and apart from clearing away of weeds there is little attention needed. Care should be taken when weeding not to damage the roots, otherwise fungus-rot will rapidly develop in the root-wounds. Occasional attention to the pruning of surplus branches and the training of the main branches is necessary.

After about eighteen months the flowers appear and owing to their structure hand-pollination is necessary to achieve fertilisation. This is facilitated by raising, with a chip of bamboo, the stigma to the anther and simultaneously pressing out the pollen. Only 5 or 6 flowers of each cluster are fertilised and the best results are obtained during the morning when the pollen sheds easily. With a little practice up to 200 flowers per hour can be fertilised.

The ovary takes two months to attain full size and another eight months to ripen. Ripening is indicated by the yellowing of the tips of the pods, and as losses from splitting are due to the pods being allowed to ripen too much on the vine, harvesting should not be delayed beyond the "yellowing" stage.

Curing of the pods is best done slowly. It consists of alternately sweating and drying and usually takes a month to complete. During this time the pods are placed in the sun for two hours a day then brought in and wrapped in blankets. The finished product should be pliable and greasy to the touch, and the colour should be dark chocolate—the fine crystals of vanillin will be seen on the surface. During the curing process great care should be taken to control any moulds which may appear on the pods.

Pods are best packed in air-tight containers and can be thus shipped, grading according to size and texture is done where the quantities warrant.

Limited quantities of cuttings are available from Nasinu and Navuso.

LIST OF VEGETABLES FOR LOCAL CULTIVATION.

THE following is a list of vegetable varieties which have been grown successfully at several Agricultural centres and which can, therefore, be recommended to growers who desire to diversify their home-grown vegetables.

Seeds of most of the following can be obtained from local firms or directly from Yates Ltd. of Auckland:—

Beet.—Turnip Rooted (Yates), Derwent Globe (Yates).

Lettuce.—Imperial (Yates), Iceberg (Yates), Mignonette (Yates).

Cabbage.—Early Drumhead (Yates), Pride of India (Sutton's).

Cauliflower.—Early Patna, Early Market, Maincrop Patna and Maincrop Benares (all Sutton's Calcutta).

Kohal Rabbi.—Early Green (Yates), Early Purple (Yates).

Cucumbers.—Apple Shaped (Yates), Crystal Apple (Yates), Long Green (Yates).

Dwarf Beans.—Canadian Wonder (Yates), Golden Wax Pod (Sutton's Calcutta).

Soya Bean.—Malayan No. 4.

Climbing Beans.—Épicure (Yates), Bonavist, Yardor Long Bean.

Dhall.—Pigeon Pea or Arhar, Mung, Urd.

Cowpea.—Giant, Dwarf, Black, White.

Green Peas.—Best of All, Supreme, Matchless, (Sutton's Calcutta), Greenfeast, Early Crop, Stratagem (Yates).

Onions.—Dhulia (India) Cuddalora (India), Early Golden Globe (Yates).

Tomatoes.—Ponderosa, Earliana, Marglobe, Burwood Prize (Yates), Break'o day.

Egg Plant or Bringal.—Black Beauty (Yates).

Carrots.—Early Horn, Long Intermediate (Yates).

Chinese Cabbage.—Fiji Local, Wong Bok (Yates), Petsai (Yates).

Silver Beet.—Lucullus (Yates).

Radish.—French Breakfast (Yates).

Sweet Corn.—Simmonds Hybrid, Potro Rico.

Brussels Sprouts.—Dwarf Gem (Sutton's Calcutta).

Pumpkins.—Queensland Blue, Triamble (Yates).

Veg. Marrows.—Long White Bush (Yates).

Potatoes.—Up to date, Early Rose (Yates).

—H.W.J.

[illegible]

Lands Department, Suva.



DIVISION OF CHEMISTRY.

MINERAL ANALYSES DURING 1938.

THERE was a marked increase in the number of samples submitted for assay during 1938, a total of 143 samples being received as compared with a total of 63 for 1937. During the latter period no base metal determinations were called for but last year, in addition to gold and silver, examinations for copper, lead, zinc and manganese dioxide were required. 119 private samples and 24 official samples were examined.

The results as a whole were of a comparatively low order, though one sample assayed 37 oz. 18 dwts. of silver and 5 dwts. of gold and another gave 5 oz. 18 dwts. of gold per ton of material. Moderate values were recorded for the base metals, while two samples submitted for the determination of manganese dioxide contained mere traces.

—W. J. B.

METEOROLOGICAL NOTES FOR THE MONTHS OF DECEMBER, 1938 AND JANUARY, 1939.

By

CAPT. G. B. NASMYTH,

Harbour Master.

December, 1938.—An exceptionally wet month, rainfall being 17.69" above the average. Mean temperature was 0.3° below normal and mean pressure at 8 a.m. 0.18. below the normal.

The month opened fine with good sunshine records, but from the 7th onwards conditions were mainly overcast with frequent heavy rain.

On 21st and 22nd a cyclone passed to the westward of Viti Levu moving S.E. to S.S.E. direction, and passed close to Lautoka on the afternoon of 21st. N.E. to Northerly gales to force 10, with very heavy rain and floodings were experienced. The lowest barometer by barograph reading was 29.35" at 3.45 p.m. and the maximum wind velocity 63 m.p.h. from N.N.E. at 4.40 p.m. on 21st.

At Lautoka the barometer fell to 29.286", 1.00 p.m. and 2.30 p.m. N.E. to N. gales to force 10 occurred there during the day, falling off about 5 p.m.

Winds of force 6 to 8 were experienced generally in the eastern part of the group.

January, 1939.—A very wet month, rainfall being 18.83" above normal. During the heavy fall on the 1st, 2.09" fell in one hour, 3 to 4 p.m.

Mean pressure at 8 a.m. was 0.062" below normal and mean temperature 0.2° below the normal.

On the 15th, pressure was relatively low in the Fiji-Tonga region. A depression developed between Keppel Island and Vavau on the 16th and 17th, gradually deepening and moving almost due west. Early on the morning of the 19th the centre passed very close to the north of Suva, and continued in a westerly direction to the west of Viti Levu, when it deepened further, and commenced to move towards the east on the 20th. In the morning of the 21st, the centre again passed close to the south of Suva, moving away fairly quickly to the S.S.E. after midday.

The lowest barometer at Suva occurred at approximately 5.45 a.m. on 19th, the barograph reading then being 28.89", and the maximum wind was 60 m.p.h. at 5.10 a.m. from E.S.E.

On the 21st the lowest barometer (mercurial) was 28.739" at noon, and the maximum wind 73 m.p.h. from N. x W. at 10.20 a.m.

There was little or no damage to buildings, but trees were uprooted and branches and palm leaves broken off, and telephone and power lines were down in several places, mainly due to trees falling on them.

Practically the whole of Fiji was affected by this storm, winds of force 8 to 10 being experienced in most places, and damage to roads and bridges, caused by rain and floods was considerable. Several trading vessels were blown ashore.

REVIEWS.

COPRA IN THE EMPIRE.

IN "Vegetable Oils and Oilseeds" for 1938, a summary is compiled by the Intelligence Branch of the Imperial Economic Committee of the world production, exports and imports of copra. The summary shows that in 1937, the world exports of copra aggregated 1,317,000 tons of which the British Empire contributed 381,000 tons. The three largest exporters were the Netherlands East Indies (489,000 tons), the Philippines (233,000 tons), and Malaya (201,000 tons), while Fiji was seventh on the list with 30,000 tons.

In 1937, the United States was the largest importer of copra (240,000 tons) mainly from the Philippines, followed by Germany with 206,000 tons, France 135,000 tons, Malaya 125,000 tons, United Kingdom 79,000 tons, Denmark 73,000 tons, India 47,000 tons and Holland 46,000.

The British Empire's net imports of copra amounted to 157,000 tons of which the United Kingdom and India accounted for 126,000 tons and Australia 22,000 tons.

Hence the balance of exports from the Empire was 224,000 tons or in other words, of the total amount of copra produced in the Empire (231,000 tons) in 1937, a market outside the Empire had to be found for 224,000 tons. This indicates the great difficulty in marketing copra produced within the Empire.

The average prices of F.M.S. Straits copra c.i.f. London during the last eight years were:—

			£	s.	d.				£	s.	d.
1931	..	..	13	18	0	1935	..	..	12	14	6
1932	..	..	15	1	3	1936	..	..	15	12	3
1933	..	..	11	7	0	1937	..	..	17	8	3
1934	..	..	9	6	9	1938	..	..	11	11	6

Owing to its poor quality the average price of South Seas copra was lower than Federated Malay States Straits copra by approximately one pound per ton throughout the eight years quoted above.

The importance of copra exports in the British Colonies may be gauged by the fact that the relative value of the exports of this commodity to the total exports in 1937, in Tonga was 96 per cent., in Western Samoa 57, Fiji 18, Papua 36, New Guinea 36, Ceylon 10.5 and in British Malaya 3.5 per cent.

In the Netherlands East Indies, the biggest exporter, the relative value was by comparison only 7.3 per cent.

LAND SETTLEMENT IN JAMAICA.

PLAN TO EXTEND CULTIVATION AND RAISE LIVING STANDARD.

JAMAICA, as a country depending almost entirely on the sale of crops in foreign markets, and of commodities manufactured from agricultural products, is still one of the least scientifically cultivated countries in the world. But the Island has at last taken agriculture seriously. The Government's proposal to spend £500,000 on land settlement (since increased to £650,000—Ed., C.C.) is regarded as a most important economic development in the Island, and is very strongly supported by all classes.

An Agricultural and Scientific Department is maintained at a cost of over £58,000 (deducting revenue) a year, and the Agricultural Society costs nearly £10,000 annually bringing the total expense for efficiency and improvement of cultivation to nearly £70,000 a year.

The work of these organisations has not hitherto had a very appreciable effect on the economic life of the Island, largely because they have not had a fair chance to apply improved methods of cultivation over a sufficiently wide area. Thousands of acres of cultivable land have remained uncultivated for many years, but several large holdings are now being purchased by the Government for settlement of needy peasants, labourers and others unemployed.

For this purpose £100,000 was by law allocated out of the £2,000,000 loan proposed by the late Sir Edward Denham shortly after he assumed governorship of the Island. £1,130,000 has already been raised and £40,500 spent on land settlement up to March 31 this year. Approximately 25,000 acres have been sold to small settlers, and the results have been gratifying. Many of the settlers have done so well that they would not now sell the land they hold at the purchase price.

There is full appreciation of the importance of export markets, and much Government thought is already being devoted to intensification of the work of the new Low Temperature and Marketing Station, which is Government managed.

Would-be settlers are, in most cases, advised to take five acres of land at an average cost of £6. The limit is 25 acres. Cost of survey, &c., brings the total to £34, to be paid in seven years. Interest is charged on arrears only, at 5 per cent. per annum.

The new proposals include building of small cottages on the settlements and loan to settlers, and in some areas employment of people seeking land, paying them wages regularly. Their crops will be marketed and they will receive the difference between crop value and wages paid plus instalments, at the end of each year.

The country is evidently prepared to be taxed to the extent of £400,000, for it is being increasingly realised that only by providing a living for employable unemployed and generally a reasonable standard for the labouring classes, will it be possible to stop the gradual increase of taxation for poor relief, which at present costs £100,000 a year.

—Journal of Jamaica Agricultural Society, Vol. XLII, 1938.

THE ESSENTIAL OILS OF THE NETHERLANDS EAST INDIES.

THE yearly world production of essential oils (turpentine and camphor oils excluded) may be estimated at about 7,000 tons. Citronella oil, which is of much importance for the Netherlands Indies, takes the first place with an average of more than 2,000 tons as a yearly total.

Essential oils are principally used in the field of perfumery, as flavouring materials and for pharmaceutical and technical purposes. The production of essential oils is subject to various risks, *e.g.*, a change of fashion in scent or flavour, artificial manufacture or the discovery of a better material as substitute for an oil used pharmaceutically or technically.

The Netherlands Indies is the principal exporter of essential oils; the weight exported by that country amounts to 20 to 25 per cent. of the world total. The value of the essential oil export used to be only about one-fifth to one-half per cent. of the total export value of the country, but it amounted to two million guilders even in the worst years of the depression. In 1937 that value was very near to three million.

Recently a Central Office for the export of essential oils of the Netherlands Indies has been established. Its work is, in the first place, to keep a check on the oils exported and further to devise means of improving the conditions of production and trade, to look for new outlets for the oils, to make propaganda for these products, &c.

By far the most important essential oil produced in the Netherlands Indies is Java citronella oil, which is distilled from the grass of *Andropogon nardus* L. subsp. *genuine* Hack. In 1936 more than 20,000 acres of citronella grass were under cultivation in Java. For the last few years the export has averaged more than 1,500 tons. The oil is exported mainly to the United States of America, France, Germany, the United Kingdom, Holland, Japan and China. The principal constituents of normal Java citronella oil are geraniol (the content of so-called total geraniol is generally at least 85 per cent.) and citronellal (33—35 per cent.); special destillates may have a much higher citronellal content. Java citronella oil is used for the preparation of several important perfumery materials (geraniol, citronellol, menthol, &c.), for perfuming soap, for keeping away mosquitoes. Competitors of the Java product are the citronella oils of Ceylon (which is derived from another variety of *Andropogon nardus* and is of a different chemical composition), of Guatemala and of Formosa. There has been some fear that the oil of *Eucalyptus citriodora* Hook. from Australia and the Seychelles, which is very rich in citronellal, might prove a dangerous rival, but an effective competition with citronella oil does not seem to be economically possible.

Vetiver oil is distilled from the roots of *Andropogon zizanioides* Urban. In the Netherlands Indies this oil is prepared in Java only, especially in the neighbourhood of Garut and Wonosobo. Production has much increased during the last few years, so that in 1937 nearly 20 tons of oil were exported, more than half of which went to France, the rest to the United States of America, other European countries and Japan. There is also a regular export of vetiver roots from Java to be distilled in the country of destination, which is generally France. The chemical structure of the oil is not yet fully known. This viscous oil plays an important part in perfumery, especially on account of its great value as a fixative. Java is the largest exporter of vetiver oil at present; Réunion also exports considerable quantities of it.

The above notes are from Dr. P. A. Rowaan's summary of his own bulletin "De Aetherische Olien Van Nederlandsch-Indie" (The Essential Oils of the Netherlands East Indies) published in Amsterdam in 1938.

PREPARATION OF TURMERIC FOR MARKET.

A MUCH improved method of polishing, which has been evolved by the Agricultural Department, employs a horizontally mounted barrel of expanded metal, two feet long by three feet diameter, provided with a handle at either end for rotation by two men. The barrel or drum takes a charge of about seventy pounds of boiled and dried turmeric which is polished in seven to ten minutes at the normal working speed of thirty revolutions per minute of the drum. The turmeric is cleaned and polished as it rolls on the expanded metal by itself would allow the small rhizomes or finger turmeric to fall out of the drum or become stuck in the mesh of the metal. The expanded metal is, therefore, covered on the outside with a tight wrapping of woven wire which is small enough in mesh to retain the finger turmeric, and at the same time large enough to allow the dust and dirt and rootlets to escape during the operation of the drum. When polishing is complete, a door, which extends the full length of the drum, is removed, and the entire charge of turmeric falls out in a few seconds into a sack or basket which is placed on the ground under the drum ready to receive it.

The normal output of the machine is over one ton of polished turmeric per eight-hour day. In Coimbatore district, where extensive trials and demonstrations have been conducted throughout the last three turmeric harvesting seasons, the machine has shown a saving of from Rs. 2 to Rs. 3 per ton in the cost of labour for polishing. Moreover, the machine-prepared produce, due to its superior finish and colour, commands a higher price in the market by Rs. 3 to Rs. 7 per ton. In addition, there is a considerable saving in time compared with any of the indigenous methods of polishing due to the machine's much larger daily out-turn. The average yield per acre of polished turmeric is about two tons.

The machine is of the simplest design, with nothing to get out of order, and robustly constructed to last for many seasons. Though primarily designed for operation by hand, it could easily be adopted for belt drive in central factories or other places where power is available. The weight of the drum including axle and handles is 165 lb.

—*Agriculture & Livestock in India*, Vol. VIII, Pt. 6, 1938. N. G. Charley, B.E., A.M.I.E.

—H.W.J.

BOTANICAL RESEARCH ON CACAO.

IN this brief account of recent botanical researches in cacao. Professor E. E. Cheesman points out that the material for botanical research is very abundant since cacao has been grown and utilised for centuries by the indigenous peoples of central and South America, all known races of the cultivated cacao readily intercross and the crop has spread to many different centres.

While there are many species, two are recognised as of major importance: of these, *Theobroma cacao* L., or "Venezuelan Crilloo" as it is known to commerce when grown in a pure state, has long, distinctly pointed pods which are deeply furrowed longitudinally, warty and most commonly of dark red colour but sometimes yellow.

The beans tend to a cylindrical shape, with rounded ends and white or pinkish (never purple) cotyledons. The tree is reputed to be rather delicate. The other commercial species is *Theo. leiocarpa* Bern. This species has smooth, oval, only slightly furrowed pods without distinct points and is commonly yellow in colour. The beans tend to be lozenge-shaped, dis-

tinctly flattened and the cotyledons are purple. This species furnishes 82 per cent. of the world's commercial cocoa and the tree is robust and hardy.

Both varieties have, however, lost their identities as a result of long-established hybridization in all cocoa-growing countries and commercial crops now present a heterogenous assemblage of types which defies classification.

The most intensive botanical work done on the crop has been in Trinidad where the wide extent of variation, fully demonstrated by Pound in 1933, is indicated in the following table derived from careful examination of 950 trees distributed over twelve blocks on good estates.

MEAN VALUES OF POD MEASUREMENTS.

Length	10.5 to 23.5 cms.	Mean = 16.0 cms.
Diameter . . .	6.1 " 10.6 cms.	" = 8.0 cms.
Ratio (shape) ..	1.3 " 2.7 cms.	" = 1.95 cms.
Shell thickness ..	0.8 " 2.4 cms.	" = 1.4 cms.
No. of beans .. .	15 " 45	" = 34.5
Pods to the pound ..	6 " 22	" = 10.5
Weight per bean .	1.1 gm. to 5.6 gm.	" = 3.2 grms.

From the results of Pound's investigations a selection programme has been planned aiming at increased yields but also keeping quality in view. The size of the beans was found to be a material factor in yield and it was also found that many trees were partially or fully self sterile.

The possibilities of vegetative propagation of selected high yielding trees have been investigated by Cheesman, who has succeeded in establishing a simple but efficient technique of striking root-cuttings.

—H.W.J.

—*Empire Journal of Experimental Agriculture*, VII, 23, 1938.

GREEN MANURING OF CITRUS TREES.

BULLETIN 120 of the Council of Scientific and Industrial Research, Australia by Messrs. West and Howard reports the results of a green manure experiment over a period of thirteen years with citrus trees at the Commonwealth Research Station, Griffith, New South Wales.

The growth of a winter green manure crop (tick beans) increased the growth and yield of trees compared with trees kept clean-cultivated.

The growth of a summer green manure crop (cowpeas) at first decreased the growth and yield of the trees owing to the competition of the cowpeas for soil moisture during the summer. After about ten years the trees on the cowpeas plots caught up to those on the clean-cultivated plots. The better growth of the trees in the cowpeas plots compared with those of the clean-cultivated plots, in later years, is due to the decline in fertility and loss of structure of the soil of the clean-cultivated plots, combined with the fact that the cowpeas do not offer such strong competition to mature trees as to young trees.

A marked seasonal cycle of soil nitrate concentration occurs on both the tick bean plots and clean-cultivated plots, the seasonal cycle being significant to 120 cm. in the clean-cultivated plots.

Rains and irrigation cause minor fluctuations in concentration of soil nitrate. The tick bean plots contain a higher annual mean nitrate content

in the surface soil than the clean-cultivated plots; but the reverse is true at the lower depths. Throughout the whole profile to 120 cm. depth, the clean-cultivated plots have the highest nitrate content.

When tick bean are ploughed in before September, little decomposition takes place and nitrates do not increase until the beginning of this month. Early September seems the best time to plough under the tick bean.

When tick beans are ploughed under, there is a rapid formation of ammonia in the surface mulch, and this persists throughout the early summer.

During growth, the green manure depresses the water table.

The increase in the water-holding capacity of the soil after several years' green manuring is statistically significant but practically unimportant. The green manure has, however, a marked effect in preventing or reducing the loss of structure of the soil that is noted in the clean-cultivated plots.

—H.W.J.

AGRICULTURE IN ENGLAND.

MR. W. S. Morrison, Minister of Agriculture and Fisheries, recently in the House of Commons, gave a review of the present position of Agriculture in England. The following extracts of his speech have been taken from the *Daily Telegraph* of 14th July, 1938.

The gross annual value of agriculture he said was £250,000,000 per annum which exceeds the annual value of agriculture in any of our Dominions.

Comparing the position in 1913 with 1936, Mr. Morrison gave the following figures: Wheat production was about the same; meat was up by 8,000,000 cwt.; milk by 320,000,000 gallons; eggs by 3,000,000,000, an increase of 200 per cent., and sugar was one-quarter of our total requirements, against none in 1913. There was also an increase in fruit and vegetables, apples being up from 4,000,000 to 10,000,000 cwt.

Declines were shown in oats of 294,000 tons, barley 600,000 tons, and there were also declines in peas and beans. Beer, in which barley was sometimes used [laughter] was down from 36,000,000 barrels to 22,000,000 barrels.

In human foods there had been increased production in regard to the dietary preferred by the public, but in animal foods there was a decrease. He wished more of the latter were produced at home instead of being imported, and that the aim of the grass-land campaign, with subsidies for lime and basic slag.

We are now producing a larger percentage of our total requirements of foodstuffs than we were before the War.

There had been a change in methods of agriculture in these years which might be described roughly, although not accurately, as a change over from arable to grassland farming.

It would be a mistake and a difficult thing to do to check the present tendency and to concentrate upon arable cultivation unless it could be made permanently prosperous.

The change from arable to grass farming had had its effect upon the workers employed in agriculture. This did not necessarily mean that there had been a decline. The fact was that the agricultural worker of to-day had not only changed in quantity, but also in quality. He received more remuneration, was better housed and the output per head was greater.

Since 1930 there had been considerable increases in the production of beef, pigs, milk and other commodities, and if favourable weather conditions continued this year the wheat harvest promised to be the best since 1922.

The Government had been instrumental in increasing agricultural production and purchasing power. They had always proceeded on the principle

that the price of produce was vital to the farmer that he was entitled to protection from dumping, and that the home producer had first rights to the home market.

At the bottom of the problem was the question of markets. In the case of the livestock industry the Government took power to regulate the importation of meat from all sources and entrusted the duty of regulating the market to the Beef Conference.

"The great edifice we have built up of commerce and industry in this country," said Mr. Morrison, "rests on the foundation of primary production in the Empire as well as in our own country. If the primary producer is denied his proper reward it soon brings ruin on those who hope to sell him their goods. The organisation of markets of this kind will be a real contribution not only to the prosperity of agriculture, but the prosperity of trade and commerce throughout the world."

"We have followed and intend to follow in the policy that we have adopted," he added, "which is to attack each of the many problems through the instrument of improving the returns and the prosperity of farmers and their workmen, in the belief that a prosperous rural community will solve many of its own problems for itself."

"The process is necessarily a slow one, as much of its problem has been left long neglected, and is none the easier of solution for this cause. I think agriculturalists may take courage in the revolution that has taken place in the last seven years in the attitude of the Government and this House towards the oldest and greatest of our industries."

—H.W.J.

THE ARTIFICIAL PRODUCTION OF POLYPLOID PLANTS.

A RECENT publication of the Imperial Bureau of Plant Breeding and Genetics* draws attention not only to a most interesting and entirely new method being employed in plant breeding but also serves to emphasize the rapidity with which research makes use of new knowledge.

Polyploid plants, (that is plants whose genetic constitution has been altered by the doubling of the somatic chromosomes, have been known for sometime but this occurrence has been extremely rare and irregular.

The discovery of the action of the drug colchicine on nuclear division has placed in the hands of the plant breeder an agent whereby polyploids may be produced almost at will, so enabling him to control and regulate what have always been regarded as among the most unstable phenomena of Nature.

Colchicine is an alkaloid occurring in the autumn Crocus (*Colchicum autumnale*) which has long been known as a poison and as a specific for gout; but it is only two or three years since its effect on the living processes of plant cells called for intensive investigation.

The results of these investigations and their practical significance are excellently summarized in the Bulletin referred to. This bulletin gives a clear account of the phenomena of chromosome doubling and the effect of colchicine thereon, and describes the results already achieved in the production of artificial polyploids by this means.

The work of Russian investigators on the action and use of acenaphthene for a similar purpose is also described; and details of technique together with a Bibliography of 38 references completes a useful summary for workers in this field.

—B E. V. P.

* The Action and Use of Colchicine in the Production of Polyploid Plants by J. L. Fyfe, Imp. Bureau of Plant Breeding and Genetics—Cambridge, England—1939.

EXTRACTS.

CONFERENCE OF COLONIAL DIRECTORS OF AGRICULTURE.

THE second Conference of Colonial Directors of Agriculture in London was held at the Colonial Office in July. Lord Dufferin and Ava, Parliamentary Under-Secretary of State, presided, and Sir Frank Stockdale and Dr. H. A. Tempany represented the Colonial Office.

Lord Dufferin, inaugurating the Conference, said that collaboration between the several technical departments, and between them and the administrative service, was essential to progress in all matters concerned with the two fundamentally important subjects of soil conservation and nutrition. It was hoped that the conjoint consideration of the items on the agenda dealing with soil conservation by officers of the Agricultural, Veterinary and Forestry Departments would be productive of useful results, and similarly, the subject of nutrition was of concern to all Departments of Government and could not be considered satisfactorily in isolation by one single department.

Consideration would be given at the Conference to matters connected with the work of the Imperial Agricultural Bureaux, which now embraced all the branches of science concerned with crop production and the livestock industry, as well as the pests and diseases of crops and stock. An Imperial Bureau of Forestry was also in process of formation as the result of the recommendation of the Commonwealth Scientific Conference held in London in September, 1936, and an Imperial Bureau for Dairying had recently been started as the result of recommendations made by the same Conference.

On recruitment to the Colonial Agricultural and allied Services, Lord Dufferin said that it was not easy at present to judge the results of the scholarship scheme for the training of Colonial Veterinary Officers. The Agricultural Advisory Council had, however, recommended its continuance, and the Secretary of State had agreed. Recruitment to the Colonial Veterinary Service had been a matter of some difficulty during the past two years, and the whole question was at present under consideration, for early steps would have to be taken to meet Colonial demands for veterinary officers, particularly in East Africa.

On the crucial subject of the dangers of soil erosion, Lord Dufferin said that in East Africa overstocking, or rather a faulty distribution of stock, was assuming serious proportions. The position in regard to soil erosion in the Colonial Empire had been reviewed in a memorandum which had been sent to all Dependences, and the Secretary of State had asked to be supplied annually with a report of the position in each Dependency, together with a summary of progress made in relation to antierosion measures. Much work had already been started with the object of checking erosion and of ensuring a satisfactory conservation of soil resources, but much still remained to be done. The maintenance of the cultivable soils and of their fertility must inevitably be one of the foundations upon which all agricultural policies were built, and unless those foundations were sound the superstructure was bound to fall sooner or later. An exchange of views, therefore, on matters concerned with soil conservation would form an important part of the deliberations of the Conference, and it was expected that in the discussions the importance of mixed farming, whereby animal husbandry was introduced into the system of crop production, would be recognised. Considerable progress had been made with mixed farming in the Northern Provinces of Nigeria, and endeavours were being made to introduce similar systems of husbandry in other territories. Increasing attention must be given also to the production of greater amounts and variety in local foodstuffs, and when considering the production of greater supplies of foodstuffs, nutritional requirements should not be overlooked.

In the subsequent discussion, Mr. E. Harrison (Tanganyika) remarked on the much greater interest now taken in Colonial problems, attributing it to the care with which the Colonial Office now surveyed and examined all the work of the Agricultural, Veterinary, Forestry and Educational departments.

Mr. G. A. Jones (Leeward and Windward Islands) and Mr. R. Daubney (Kenya) thought that much good would come out of the Secretary of State's wish that their problems should be discussed with other departments more fully. They were especially glad of the co-operation of the Veterinary and Forestry departments in their work.

Dr. Bryce (Nigeria) said there was good co-operation in Nigeria between the Administrative and the Agricultural services, though they had not been able yet to go as far as they would like in the matter of co-operation with other services.

SOUTH AFRICAN CO-OPERATION.

Dr. T. G. W. Reinecke (Director of Native Agriculture in the Union of South Africa, who attended on behalf of his Government) assured Lord Dufferin that the Union Government were most anxious to co-operate with the Colonial dependencies. It was important that the technical departments should co-operate with the administrative. On the difficult question of de-stocking, he agreed that they must gain the confidence of the people in the steps they were taking. Erosion was causing the absolute impoverishment of the natives. Economic rehabilitation of the people after drought was the sole way to solve the difficulty.

At the Government luncheon to the delegates at the May Fair Hotel, Mr. Malcolm MacDonald, Secretary of State, extended a warm welcome to all present at the Conference, and said that at the Colonial Office they fully realised that agriculture was of basic importance to all the Colonies. He trusted, therefore, that the Conference would be especially fruitful in its deliberations.

The delegates included Sir G. Evans, Imperial College of Tropical Agriculture; Mr. L. R. Doughty, Amani; Mr. R. Daubney, Kenya; Mr. A. S. Richardson, Tanganyika; Mr. C. J. Lewin, Northern Rhodesia; Mr. J. C. Muir, Zanzibar; Dr. G. Bryce and Mr. G. F. Clay, Nigeria; Dr. F. J. Martin, Sierra Leone; Mr. F. W. Hall, Gambia; Mr. F. P. Jepson, Ceylon; Mr. F. Birkinshaw and Mr. R. A. B. Stanhope, Malaya; Mr. F. L. Squibbs, Seychelles; Mr. T. A. Russell, Bermuda; Captain F. Burnett, British Guiana; Mr. G. A. Jones, Leewards and Windwards; Mr. F. G. Harcourt, Dominica; Mr. A. Pitcairn, Cyprus; Mr. G. N. Sale, Palestine; Dr. H. W. Jack, Fiji; and Mr. L. F. Wachter, South African High Commission Territories, and amongst the guests present at the luncheon were Sir Algernon Aspinall, Sir David Chadwick, Sir John Chancellor, Sir Daniel Hall, Sir Arthur Hill, Sir Harry Lindsay, Sir John Orr, Sir John Russell and Sir Alan Rae Smith.

The second day of the conference was devoted to consideration of the question of soil conservation. Memoranda setting out the position in each Colonial territory where this question is of importance were made available to the delegates. In the course of discussion particular points and difficulties occurring in various territories were indicated, and a critical discussion of the position ensued in which a number of leading experts in this country, including Sir Daniel Hall, Sir John Russell, Mr. S. Milligan, Mr. W. Nowell and others, participated.

It was clear from the discussion that the importance of the question is now widely appreciated in the various territories, and that active steps are being taken in many of them to remedy or counteract the evils. Much work remains to be done, but the outlook may be described as moderately

hopeful. Further scientific study of the fundamental factors underlying erosion is required, while it still needs to be insisted that the prevention of erosion is a definite duty of the Administration as a whole and not merely the particular province of technical officers. In this connection, the importance of collaboration between the various technical departments, concerned with the problem and Administration was emphasised. It seemed clear that questions of land tenure, provision of water supplies and control of grazing were essential factors in any programme of control. It was felt that as a result of the considerable publicity which had been given to the question during the past few years there had been a great awakening of public consciousness to the dangers of the position, and that useful work was being done in many Dependencies. It was essential that this work should be maintained and extended.

MIXED FARMING.

The part which animal husbandry can play in the evolution of systems of mixed farming under tropical conditions came under discussion on the third day, when it appeared that in the substitution of systems of mixed farming in continuously cultivated areas for the shifting systems of agriculture formerly practised lies the most promising method of maintaining fertility in native cultivation under tropical African conditions. The progress made in this direction in Nigeria and in other African Colonies was reviewed, and certain of the difficulties, particularly those connected with the provision of the necessary stock and implements and the training of the native cultivator for this new form of agriculture, were discussed. Stress was laid on the necessity for extensive preliminary experiment and the need of special provision for training native cultivators in the new methods when they had been evolved.

The following session was devoted to discussion of the part which could be played by the Agricultural and Veterinary Departments in efforts to improve nutritional conditions among natives in tropical dependencies. In addition to the representatives from the various Colonies, the session was attended by Sir John Orr, Director of the Rowett Research Institute, Dr. A. J. O'Brien, Medical Adviser to the Colonial Office, and by representatives of the Colonial Education Committee. Details were given of the efforts in progress in the various Dependencies, in the majority, Nutrition Committees have been set up and the accumulation of data in relation to native nutrition has begun. Attention was directed to the necessity for endeavouring to harmonise the provision of an improved dietary with the limitations laid down by agricultural conditions. Many instances were given of the effect which defective nutrition had on the physique of native peoples. Reference was made to the attention now being devoted to problems of nutrition in the United Kingdom and the Dominions.

It was pointed out that under Colonial conditions the work of Agricultural and Veterinary Departments in improving nutrition was of primary and fundamental importance, and that this work should be closely correlated with the work of Departments of Public Health and with efforts to popularise the knowledge gained through the medium of education.

The morning session of the fourth day of the Conference was devoted to discussion of the different aspects of land settlement, with special reference to their effect on the conservation of the fertility of the land. The discussion covered many parts of the Colonial Empire, but special attention was paid to the position in the West Indies. Information had been supplied to various members regarding schemes for land settlement in other parts of the Empire, and attention had been directed to lessons that could be learned

from the work of the Land Settlement Association in Great Britain. It was clear that successful settlement demanded not only the provision of suitably sited land but also adequate provision to ensure that the settlers were selected with a view to their suitability for the purpose and that the necessary training, guidance and supervision in their operations should be forthcoming throughout. Particular emphasis was laid on the necessity for assisting settlers in the purchase of their requirements and the supply on easy terms of the necessary housing accommodation, buildings, tools, equipment and materials, and in the sale of their produce. It was shown how neglect of certain of these factors had led to failures in the past, and the discussion indicated how, in plans of the future, due allowance was being made for requirements in these respects.

Special consideration was paid to the question of tenure. It was stated that in many areas ultimate freehold possession of holdings was considered essential, but it was pointed out that this brought in its train certain dangers which might result in the ultimate dissipation and frustration of efforts at the end of a period of years. It was considered that on general grounds a system of leases with adequate safeguards might be preferable.

The afternoon session was devoted to the consideration of systems of produce inspection in vogue in the Colonial Dependencies, and the results which had been achieved thereunder. Reference was made to the successful results which had attended the introduction of this system in various dependencies, particularly in Nigeria; the success of this provision had been such that the necessity for its continuance on a permanent basis had been recognised.

The necessity in all such schemes for obtaining the support of the mercantile community engaged in the purchase and shipment of the produce was emphasised. This had been secured in Nigeria by appointing advisory committees on which mercantile firms were represented. Where failures had been encountered they were frequently due to insufficient collaboration with merchants and lack of adequate explanations of the objects sought. It was clear that such systems were likely to be fully successful only where the improvement of the quality of the produce met the demands of the market, or else was effective in safeguarding the produce from deterioration and loss. In this connection the need for defining the market requirements was stressed. The extension of the system wherever openings for it could be shown to exist was obviously desirable.

EDUCATION AND TRAINING.

The discussion on the fifth day of the conference was on the subject of education and training in agriculture in the Colonial Dependencies, and was attended by Sir William McLean, Mr. Arthur Mayhew and other members of the Colonial Advisory Committee on Education. Progress made was reviewed, and it was clear that there was general appreciation of the outstanding needs. These comprise, on the one hand, further professional training for officers and assistants required in the work of Colonial Agricultural Departments and in large-scale agricultural industry; and, on the other training the cultivator so as to lead to better farming methods and a general improvement in the standard of living under rural conditions.

In relation to the first-named, the work of the Imperial College of Agriculture in Trinidad is filling a role of first-class importance, which is being supplemented by parallel provision in a number of Dependencies for training at a somewhat lower level. Plans have now been approved whereby certain officers trained at these local institutions may be selected to receive higher training at Trinidad.

It was emphasised that the training of small holders bear a practical relationship to the conditions under which they normally lived, and should be so directed that, when their training was finished, pupils could return to their homes with no distaste for their original conditions, but able and ready to take a leading part in the general movement for rural improvement. It was agreed that, while progress in this direction must necessarily be slow, there are signs that existing efforts are for the most part directed along soundly conceived lines, which may be expected to bear substantial fruit in due time.

Later, there was a discussion of details of the various methods of bringing the results of experiment and research to the notice of agriculturists in the Colonial Dependencies, and ensuring that they were translated into practice.

—*Crown Colonist*, September, 1938.

CONFERENCE OF COLONIAL DIRECTORS OF AGRICULTURE, (ENTOMOLOGY AND ANIMAL HUSBANDRY).

THE Conference,* in its conclusions and recommendations placed on record its high appreciation of the work of the Imperial Institute of Entomology and has no suggestion of major importance to make concerning the manner in which its functions are performed so far as the Colonial Empire is concerned.

The Conference stresses the importance of active measures being taken to control the losses being occasioned by termites in the Colonial Empire and expresses the hope that the Executive Council of the Imperial Agricultural Bureaux may be able to take such steps as will lead to the collection and interchange of information on the lines recommended by the Commonwealth Scientific Conference at as early a date as may be possible.

In particular it is desirable that material showing the various stages of the development of the different species of termite which occur in the Colonial Empire, together with an account of their distribution and the character of the damage done by them, should be submitted to the Imperial Institute of Entomology, with a view to establishing the species which should be regarded as dangerous and destructive and to determining their distribution.

The Conference desires to lay stress on the importance of securing the active collaboration of other Government authorities with the official Entomologists in termite investigations and particularly that of the Public Works Department.

—R. J. A. W. L.

The conference emphasizes the value of animal husbandry in mixed farming from the point of view of improving soil fertility.

Progress has been made in Nigeria with trials of this nature and it is urged that efforts be made to investigate the possibility of animal husbandry in mixed farming in wet areas.

Interest was taken in the folding of sheep in the forest areas of the Gold Coast, and the keeping of poultry in citrus cultivation, both of which were successful.

The introduction of disease into many areas must be kept in mind in recommending importations of stock or in moving stock from district to district within any Colony.

Preliminary experimental work and subsequent use of the more progressive farmers as demonstrators is advised.

The question of finance should be dealt with by co-operative societies and advances of money on easy terms for stock and implements are recommended.

Subsequently, Government assistance should take the form of provision of water supplies, instruction, thrift societies, provision of stock at the lowest possible prices, veterinary services and markets

—H.T.H.B.

* Conference of Colonial Directors of Agriculture, London, July, 1938.

FORESTRY IN THE EMPIRE.

LORD Clarendon, the Chairman, presided at the dinner of the Empire Forestry Association, which was held on 27th May in London.

In proposing the toast "Forestry in the Empire," Lord Clarendon spoke of what that phrase implied. He said that probably not one man in a hundred realized that 2,479,000 square miles of the Empire, or about one-quarter of its land surface, was under forest. It was an extraordinary thing that with such a heritage the people of the Empire were so little forest-minded, though perhaps it might be accounted for by repressive forest laws in early days in the mother country, and the necessity in newer countries for the pioneers, by the sweat of their brows, to wrest land from the forests for food production. Continuing, Lord Clarendon showed that Empire Forestry gives rise to an Empire export trade worth £40,000,000 per annum, for which Canada, holding almost half the forest area and by far the richest half, is responsible for seven-eighths; Australia and then India and Burma following next, but a long way behind. For imports of forest products the United Kingdom is the main market, taking 20 per cent. of its softwood and 35 per cent. of its hardwoods from Empire sources. From this great trade there comes to mind the stream of wealth arising from Empire forests. Railways, steamships, sawmills, pulp and paper factories are vitalized by their products. Empire forests are therefore of the greatest Imperial significance and importance, and importance which he predicted would increase enormously. Research was always broadening the base for the use of wood and industry would turn more and more to forests as the source of raw material. Concluding, Lord Clarendon said he could not dissociate Forestry in the Empire from the small band of perhaps rather more than 1,500 trained men in whose direct charge the care of the forests is placed. Often in the remote and hard places of the earth these officers carry on in face of physical difficulties and mental discouragement. For political reasons they may see their forests harried or, on the grounds of problematical expedience, their recommendation for working them conservatively turned down, but still they carry on, hoping that reason will ultimately prevail. The paths of others no doubt lie in more pleasant places, but to all the Empire owes a debt of gratitude for their devotion to duty, which it is perhaps unfortunate those in high places do not more frequently recognize.

—Empire Forestry Journal, Vo. 17, No. 1, 1938.

LOCAL FORESTRY.

In company with many another colony, forest organisation in Fiji has suffered in the past from lack of funds. Recommendations in earlier reports (Mr. J. P. Mead was here to advise in 1927 and Mr. R. A. Sykes in 1932-30) had resulted in the enactment of a framework of certain essential legislation, though its efficacy may be questioned on the grounds that no staff had been provided for its enforcement except in the mangroves near the capital. Towards the end of 1937, however, sanction was given for the formation of a small department and the writer was seconded from Malaya to that end.

Within a month of arrival it is difficult to write more than a sketchy contribution for this issue of the Bulletin, but a few general notes may be of interest.

The lumbering industry consists of one Company working in a relatively rich stand of Fiji Kauri (*Agathis vitiensis*) in the hills (3,000 feet), with a maximum sawmill capacity of about 10 tons per day, and a number of scattered smaller outfits whose main interest is the supply of banana and citrus fruit cases. The former concern pays royalties representing about 3 per cent *ad valorem*: nothing is collected from the latter, whose supplies are usually the subject of private agreements between Indian loggers and the Fijian landowners.

As a consequence, nothing is known of the amount of timber consumed locally, though it is probable that local supplies can, at present, satisfy about half of the domestic demand. The balance is made up of imports, almost exclusively of Douglas Fir from Canada for ordinary building purposes, and of Eucalyptus from Australia where durable hardwoods are required.

Uncontrolled selection fellings in stands containing only a small proportion of valuable species have, as was only to be expected, already degraded considerable areas of forest within reach of the larger towns, but two factors have fortunately exercised some control over the degree to which such degradation has proceeded. In the first place, the broken nature of the country has largely confined the efforts of casual workers to narrow strips giving on to roads and navigable rivers; and secondly, the misguided ideas of the millers in forcing on to the market, as "hardwoods," species of which little or nothing was known have raised such prejudice against local constructional timbers that, in many quarters, Douglas Fir has acquired the reputation of being admirably durable when it is in fact nothing of the kind. The repercussions of this attitude will probably be felt for some years but it teaches a useful lesson, and there is no reason why a policy backed by information instead of guesswork should not gradually bring our own timbers back into favour.

Easily the greatest difficulty in the way of forest organisation is the fact—by no means unique, of course—that the natives, by treaty, own practically the whole of the land. It is considered expedient therefore not to rush into legislation but rather to study the problem at leisure with a view to avoiding measures which might raise more antagonism than they are worth. At any rate the situation is interesting to one accustomed heretofore to the delightful simplicity of State ownership.

—J. S. SMITH, Conservator of Forests, Fiji.

—Empire Forest Departments' News Bulletin for the first half of 1938.

CANADA'S FORESTS.

"The Dominion (Canada) Forestry Report states that while no accurate summing up of forest fires in Canada's forests has ever been made, yet it is estimated that sixty per cent. of the original forest has been burned, thirteen per cent. has been cut for use and twenty-seven per cent. still remains. It is well to study this report in the light of the fact that within 30 years Canada has stripped itself of quite one-third of its timber wealth, and that within another half century there will be no timber left to cut, if afforestation on an aggressive scale is not immediately introduced. Forests, it must always be remembered by those who take the shorter commercial view, are a long distance or lock-up investment, which takes several decades to bring to maturity.

Sales of timber in Canada bring a cash return of \$300,000,000 annually, but how long can this last?

In New Zealand the State Forestry Service since 1923 has planned "to ensure a balanced system of planting both hard and soft woods in proper proportion."

In Australia a long view has already been taken and plans have been designed to "bring regeneration operations abreast of logging operations."

In East Africa "a tree can only be cut for commercial purposes when another has already been planted in its stead."

In South Africa "only .2 per cent. of the area of the Union" is under forest but though "the Union lacks a forest, it is definitely providing timber by aggressive planting under a Forestry Division with ample funds at its command" and aims at being "an independent producer of timber."

"In Ceylon and Malaya great forests exist which have not yet been scoured" and "the forests of India and Burma are still very rich in wooded wealth but little is being done to reafforest the areas cut down."

"In summarising the field as a whole, apart from South Africa where timber is scarce, and New Zealand where more timber trees than are necessary are being planted, the other Dominions and Colonies have permitted a short-sighted policy in the matter of forest wealth. At this time, when so much is being written about the need for populating the vacant spaces of our Empire with British stock, some Dominions might well be advised to take stock of the future with an eye to absorbing labour. Forestry calls for strenuous work, but is none the less healthy, and produces a fine type of man."

—*United Empire*, May, 1938.

NOTES ON COPRA.

"Copra dried to 6 to 7 per cent. if stored in a well-ventilated dry store at an even temperature will not seriously deteriorate. It is apparent that there is little to gain by drying copra much below 6 per cent. moisture content, although in the past much more stringent recommendations have been made."

—*The Tropical Agriculturist*, Vol. 89, No. 5, 1937.

"New Guinea copra is submitted to a compulsory system of inspection and is sold on the London market as 'hot-air-dried,' 'plantation sun-dried,' and 'common or smoke-dried.' A fourth grade known as 'trade copra' is not recognised in London, but a large portion of this quality goes to Marseilles.

About 60 to 70 per cent. of the copra produced is 'hot-air-dried' the price of which is always higher than that of South Seas copra: on the average a premium of £1 can be relied upon. The difference in prices of the four grades is apt to vary from time to time: from April, 1933, to January, 1936, 'hot-air-dried' commanded on the average 24s. per ton more than 'smoke-dried,' 18s. more than 'trade' and from 2s. 6d. to 3s. 6d. more than 'plantation-sun-dried'."

—*Bulletin of Imperial Institute*, Vol. XXXV, No. 1, 1937.

"As usually shipped in the East, copra is attacked in transit by moulds and insects, resulting in serious losses and deterioration. Experiment had shown that it can be dried to such an extent that moulds and insects do not touch it, and that the resultant short weight is amply compensated by the absence of loss. This is not yet fully appreciated, but undoubtedly will be in time."—*Supplement to "United Empire,"* August, 1938.

WORLD EXPORTS OF PLANTATION CROPS.

Crops.	1930.	1931.	1932.	1933.	1934.	1935.	1936.	1937.
Cocoa (thousand tons) ..	475	546	560	570	592	678	712	645
Sugar (thousand tons) ..	12,532	11,383	11,254	9,898	9,891	10,084	10,601	11,289
Tobacco (million lb) ..	1,245	1,151	996	927	930	955	950	1,015
Coffee (thousand cwt.) ..	30,621	33,155	26,679	31,091	29,739	31,920	32,573	29,630
Tea (million lb) ..	878	889	910	833	841	830	835	889
Rubber (thousand tons) ..	827	801	709	854	1,017	872	858	1,135

From "Plantation Crops," published by the Imperial Economic Committee, 1938. H.M. Stationery Office, London. 2s. 6d.

TOBACCO FEDERATION OF THE BRITISH EMPIRE.

THE Tobacco Federation of the British Empire is composed of members nominated by Producers' Associations in Australia, Canada, India, Jamaica, Mauritius, Northern Rhodesia, Uganda, Nyasaland, South Africa and Southern Rhodesia.

The President of the Federation is Colonel Charles Ponsonby, T.D., M.P., and the Secretary is Mr. John Pitcher, and the aim of the Federation is to improve the status of Empire grown tobacco within the Empire.

At a recent meeting of the council of the Federation, it was indicated that the demand for good flue-cured Empire tobacco must continue to rise in order to cope with the increasing consumption of the lower priced types of cigarettes.

Indian flue-cured tobacco for 1937-38 is estimated at 38,000,000 lb "which is double the crop" of the preceding year and prices for good grades are quoted in London as ranging from 1s. to 1s. 8d. per lb, while the average price for the whole crop is stated to be approximately 6d. per lb.

It was stated that not only is cigarette smoking increasing in popularity in the United Kingdom but so also is pipe smoking. One large firm reported a fifty per cent. increase in pipe sales over the past four years.

—(Extract from Tobacco Note 44 of the Tobacco Federation of the British Empire.)